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PROTECTION OF THE ENVIRONMENT

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PROSPECTS FOR ADOPTING THE BEST AVAILABLE TECHNOLOGIES AND MOVING TO COMPREHENSIVE ENVIRONMENTAL PERMITS IN THE PRODUCTION OF GLASS AND CERAMICS (REVIEW)

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The prospects for adopting the best available technologies at enterprises producing glass and ceramics in Russia are analyzed. The modernization of the enterprises improved environmental efficacy and energy efficiency. The participation of specialized enterprises in identifying the best available technologies and determining the procedure for granting comprehensive environmental permits will make it possible to minimize the risk of moving to a new system of environmental regulation.

Key words: best available technologies, glass production, ceramic production, comprehensive environmental permits, energy- and resource-efficiency.

The concept of long-time development of the Russia Federation up to 2020 [1] places the move to the *best available technologies* (BAT) for the protection of the *environment* (E) among other top-priority national tasks. Our country needs a new system for normalizing permissible impacts on the environment that issues *comprehensive environmental permits* (CEP) to enterprises, establishes norms and adopts plans for reducing pollution in stages to levels corresponding to BAT.

A directive of the government of the Russian Federation dated 19 March 2014 established a complex of measures aimed at eliminating obsolete and inefficient technologies and adopting BAT [2]. In addition, special attention is planned for large enterprises in key economic sectors that consume considerable amounts of natural resources and having serious adverse impacts on the environment.

In accordance with draft of the federal law on the adoption of the best available technologies (legislative bill No. 584587-5 [3]) enterprises producing nonmetallic mineral products and using equipment for the following purposes are high-priority objects:

– glass production with nominal capacity 20 tons/day or more;

– production of mineral fibers with nominal melting capacity 20 tons/day or more;

– production of bricks, tiles and other building articles from fired clay with nominal capacity 1×10^6 pieces/yr or more;

– production of ceramic articles, aside from those used in construction, with nominal capacity 75 tons/day or more and (or) with the use of firing furnaces with charging density per furnace > 300 kg/m^3.

Such production operations will have to obtain comprehensive environmental permits (based on the principles of technological normalization) and prove conformity to the BAT requirements established for the corresponding sectors (subsectors) of industry. The government of the Russian Federation will have to refine the criteria for selecting enterprises and determine the list of producers.

The procedure for normalizing the adverse environmental effects of large domestic enterprises must be changed in the next few years. It is assumed that the application of the new instruments of governmental environmental regulations

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will modernize the economy and make it more energy- and resource-efficient [4, 5]. To evaluate the possible threats and benefits objectively we shall first examine in greater detail the concept of the best available technologies and comprehensive environmental permits.

The concept of the best available technologies gained currency in the 1970s and was elaborated in Europe, USSR and USA for the purpose of solving high-priority environmental problems due to the production activities of large enterprises. In one form or another (the best technologies not requiring excessive expenditures, zero-, low-waste and cleaner technologies) approaches to minimizing the adverse effects were developed and adopted in all leading countries [4]. Legislatively, the rules for environmental normalization of large enterprises based on the BAT concept were established in the European Union (EU) in 1996.

The implementation of the requirements of the directive on comprehensive prevention and monitoring of pollution [6] made it possible to reduce the adverse environmental effects considerably and made it possible to reduce the energy-intensiveness of production and limit the emissions of greenhouse gases. Macroeconomic (at the level of governments and Western Europe as a whole), socio-environmental (improvement of the state of the environment, providing access to information on comprehensive environmental permits for large enterprises and validation of improvement in the image of industry in the eyes of the public) and microeconomic (reduction or limitation of the growth in expenditures on raw materials and energy) benefits were realized.

We shall elaborate on the terminology. In accordance with the definition adopted in the EU the best available technologies comprise the most efficient latest advances for different types of activity and processes and methods of operation that attest to the practical expediency of using particular solutions as a base for establishing permits for emission (emissions, discharges, wastes and other impacts) into the environment and disposal of the wastes in order to prevent pollution or, when prevention is practically impossible, to minimize the adverse impact on the environment as a whole. In addition, the following should be underscored:

– the concept of 'technologies' (in some documents they are called technical methods) incorporates the technology used and methods of design, development, servicing, operation and decommissioning of a facility; this concept also encompasses control approaches (environmental and energy management systems);

– 'available technologies' are technologies developed on scales permitting their adoption in the corresponding sector of industry by economically and technically feasible methods taking account of the corresponding costs and benefits;

– 'best technologies' signifies the attainment of a general high level of protection of the environment as a whole by the most efficient method [6].

An interpretation of the BAT concept very close to the European one has gained currency in Russia. In accordance with the text of the legislative bill No. 584587-5 the best available technology comprises the totality of the production processes, equipment, technical methods, ways, devices and means based on modern advances in science and engineering, possessing the best combination of indices for the attainment of the objectives of environmental protection and economic efficiency, assuming technical feasibility, that are used for the production of goods, performing work and providing services at objects having an adverse effect on the environment [3].

In the member countries of the EU many years of experience have been gained in establishing a list of requirements and limitations, pertaining to the effects on the environment, imposed on large enterprises in key industries. Similar European requirements have already been established in the Republic of Belarus and the Republic of Kazakhstan [7, 8].

The sources of information on BAT, containing qualitative and quantitative descriptions of technological processes and technical setups, the characteristics of emissions, discharges of pollutants, formation and management of wastes, as well as the consumption of raw materials, materials, energy and water, are information documents on the best available technologies. These documents are being developed for the key industries in the economy and are regularly re-examined. Ordinarily, information documents are renewed once every 7 – 9 years [4]. The European Office for Comprehensive Prevention and Monitoring of Pollution prepares information documents. Representatives of an industry for which a document is being prepared, specialists in companies and experts at scientific-research institutes, universities, consulting firms and public organizations participate in the development of each document. Preliminary versions of information documents are discussed with interested parties and the final documents are approved by the European Commission and are placed on the open website of the European Office (http://eippcb.jrc.ec.europa.eu/reference/).

The information documents are being developed according to an industry model as well as a model used by the most diverse enterprises to support energy-efficient production, organizing environmental production control, optimization of purification of waste waters and exhaust gases (in the chemical industry), organizing industrial cooling systems and so on [4]. The website of the European office contains 33 current information documents.

Even though the documents are informational and referential in character the correspondence to the range of values established in them for the specific emissions and discharges, volumes of wastes produced, concentrations of harmful substances in the exhaust gases and waste waters is binding. For particular enterprises these parameters are set by means of comprehensive environmental permits, which are also binding in character. A correspondence is achieved with the adoption of BAT as described in the information documents and others, for example, in original, newly developed information documents. In such cases the companies must prove the efficacy of their nonstandard solutions. One way or another

the driving force for modernizing the economy is the securement of environmentally safer production.

It is expected that in Russia domestic informational-technical handbooks on BAT will be developed for enterprises in industries that fall under the new federal law. These handbooks must contain a description of the technological, technical and control decisions, referred to BAT, and their quantitative characteristics.

In summary, Russian practitioners have access to the texts of all European information documents written in the English language (http://eippcb.jrc.ec.europa.eu/reference/) as well as a series of original works and translations prepared as part of international projects (see, for example, the official site of the Ministry of Natural Resources and Ecology (Minpriroda) of the Russian Federation www.mnr.gov.ru/activities/list.php?part=1551 and the website of the organization Ékolain www.14000.ru).

The Russian Ministry of the Environment (Minpriroda) is developing a system for issuing CEP based on the BAT concept. Detailed recommendations for a procedure for issuing CEP have been developed as part of the international project 'Air Quality Control in the Eastern Countries of the European Neighborhood and Partnership Policy' (http://airgovernance.eu?lang=rus). The experts of the project have prepared guidelines for comprehensive environmental permits and made a preliminary inventory of enterprises of a number of enterprises that must obtain CEP in Russia.

A pilot project on the development of technologically grounded maximum permissible emissions and industrial environmental monitoring systems in the cement industry was also implemented with the participation of specialists from Belarus and Russia as part of the project 'Air Quality Control' [9]. A comparative analysis of the environmental efficacy of the production of ceramic brick in the participating countries in the project is to be performed in 2014 (Armenia, Azerbaidzhan, Belarus, Georgia, Moldova, Russia and Ukraine). The most complete collection of currently available Russian-language information documents on BAT is located on the site of this project. These documents are actively used in the countries participating in the project (http://airgovernance.eu/index.php?a=main&pid=35&lang=rus).

On July 2, 2014 the State Duma passed a draft of the federal law that will require large enterprises in key industries to adopt BAT and obtain CEP. As a result of intense work done by Russian and international experts information on the best available technologies is being disseminated in our country, pilot industrial and regional projects are being conducted (see, for example, the information on the site www.14000.ru), and monographs, articles and textbooks are being published [4, 10 – 14]. However, industrialists and associates at environmental protection agencies are still far from mastery of the material and in many cases talk about domestic companies not being prepared for CEP.

We emphasize that quite low threshold capacities for enterprises required to obtain comprehensive environmental permits are still being discussed in Russia. For this reason, according to preliminary assessments, all plants producing ceramic brick (about 300 enterprises), practically all enterprises (> 40) producing ceramic tiles and ceramic sanitary ware, at least 12 sheet glass plants, 20 enterprises producing container glass and high-quality dinnerware as well as several plants producing glass wool and fiberglass all belong to this group. It is difficult to predict the final list of enterprises, but this question must be raised and a definite and well-grounded decision must be made.

Minpriroda of Russia and regional offices of Rosprirodnadzor have already begun to inventory organizations that will have to obtain comprehensive environmental permits. It is expected that as a first step (2019 – 2022) pilot projects on transitioning to technological normalization and CEP will be implemented at 300 domestic enterprises and this number will increase to 15,000 by 2022 – 2029 [15].

It is also expected that the preparation of informational-technical handbooks will begin immediately, but a procedure for developing and discussing them has still not been developed, just as regulations for preparing announcements and issuing comprehensive environmental permits has not been established. Operating enterprises will have to demonstrate compliance with the BAT requirements systematized in handbooks, using instruments from independent assessments (for example, an environmental audit). In addition, in the best situation there will be lead organizations ready to voluntarily demonstrate the adoption of BAT and conformity to the new environmental requirements.

In the first place, this makes it possible to determine clear boundary conditions for picking technological and technical solutions during reconstruction and to avoid excessive expenditures associated with the need to adopt BAT outside the planned investment cycle. In the second place, as a rule, the frequency and depth of inspections performed at enterprises that have voluntarily adopted modern instruments of environmental regulation are somewhat lower than usual [16]. In the third place, the organizations adopting BAT will be freed from making payments for environmental pollution [15]. The list is incomplete, and we shall also turn to aspects of the expected advantages of government purchases, the possibilities of including enterprises in 'green' supply chains and so on.

In order to analyze the prospects for transitioning to CEP the enterprises producing glass and ceramics must evaluate the state of the corresponding industrial sectors in Russia.

Sheet glass producers show growth due to a favorable construction market and timely modernization. The level of tooling in domestic enterprises is quite high. In contrast to many other sectors, significant modernization has occurred in the glass industry at the beginning of the 21st century. In 2005 about 38% of domestic glass was produced by the obsolete method of vertical drawing. By 2013 only 2% was produced in this manner. The remaining sheet glass was pro-

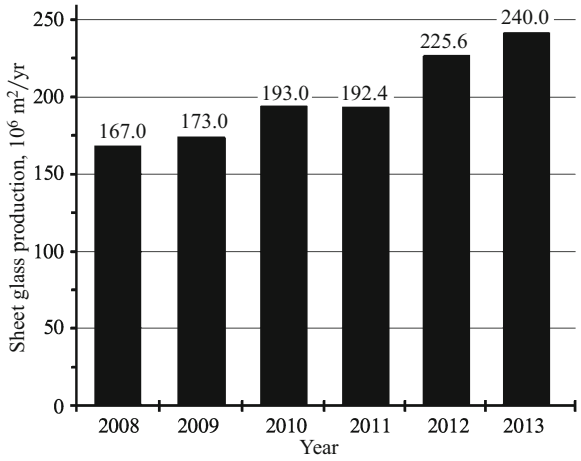

Fig. 1. Sheet glass production in Russia (according to data in [17]).

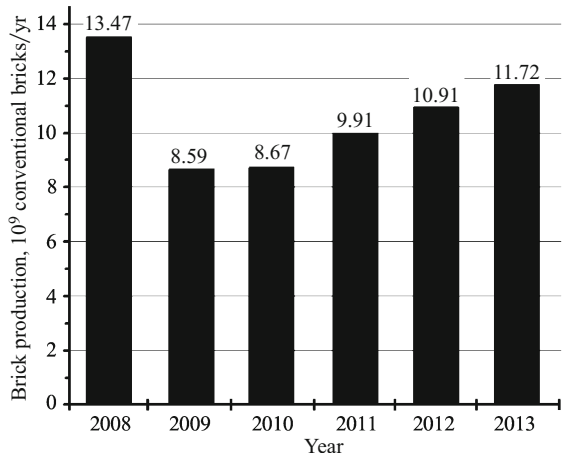

Fig. 2. Production of ceramic bricks in Russia (according to [21], with revisions).

duced by the modern float technology. In Russia the thirteenth sheet glass plant is being prepared for startup: Trakya Glass Rus (nominal capacity 15×10^6 m^2/yr; investment 325×10^6 USD). It is being built in the town of Elabuga (Tatarstan) [17].

Modern, completely automated lines have been built in our country in the last ten years. According to assessments made by specialists [17], glassmaking furnaces of the last generation are distinguished by high energy- and resource-efficiency. In addition, a process of making batch by means of a new technology developed by domestic companies (for example, Stromizmeritel' JSC in Nizhny Novgorod) and foreign companies (the German company Zippe, British company Emma and others) has been perfected at Russian enterprises.

According to preliminary assessments by the National Joint Council of Glass Enterprises StekloSoyuz (StekloSoyuz, Russia) the production volume of sheet glass in Russian in 2013 was about 240×10^6 m^2, which is 6% larger than the year before (Fig. 1). Domestic joint-stock companies, such as Salavatsteklo, Saratovstroisteklo and Star Glass still account for a significant fraction of the glass on the market (about 40%). The production volume of sheet glass on the internal market, including due to the presence of foreign firms, has practically tripled (85×10^6 m^2 in 2003) in the last ten years, which makes it possible to meet the demand. Experts at StekloSoyuz predict continued growth in the production of sheet glass (by 10 – 15% per year), which should meet the construction demand. The production volume of sheet glass could increase to 300×10^6 m^2 by 2017.

The **reduced demand for glass bottles** and increased competition between the producers of glass containers in the last few years are due to reduced production of alcoholic beverages in Russia [18]. Probably, expecting increased consumption of alcohol-free beverages as well as wine and beer produced domestically, the owners of glass plants are making significant investments in new technological equipment, striving to establish production lines that make it possible to expeditiously change the list of products depending on customer requirements. In recent years Russian companies have been successfully mastering the production of thin-wall bottles. Modern production technologies are also aimed at making enterprises more energy- and resource-efficient [19, 20].

Ceramic bricks are the most common building material, and in our country brick production is ubiquitous. There are more than 300 enterprises producing bricks in Russia. The largest ones, the LSR[4] and Weinerberger[5] groups, produce no more than 10% of the total. Mechanized plants producing $(50 – 100) \times 10^6$ pieces/yr, equipped with powerful clay-processing and molding machines as well as mechanized economical driers and furnaces, have been built in the last ten years. Almost 70% of the total production is done by small and medium size plants in Russia [21], but even such enterprises are now required to adopt BAT and obtain comprehensive environmental permits [3].

Brick production reached a maximum in 1991. Before 2004 – 2005 brick production in Russia remained practically at the mid-1990s level, having dropped to half the peak level recorded in 1991. Appreciable growth was observed in the pre-crisis years 2006 – 2008, but the industry still has not recovered after the production drop due to the crisis (Fig. 2). Even though the production volumes are not increasing very rapidly, the industry is undergoing internal reorganization: old inefficient plants are being shut down and new, larger-capacity plants with lower production costs are being built.

Since 2003 investors in Russia have begun to build plants with higher capacity from 100×10^6 bricks. But there is a limit to production increases. The average capacity of the

[4] The capacity of Pobeda LSR JSC in Leningrad Oblast' is 160×10^6 bricks per year. After the brick plant in Nikol'skii in Leningrad Oblast' reaches full capacity brick production will reach 220×10^6 bricks.

[5] Plant capacity exceeds 200×10^6 bricks in the Vladimir Oblast' and 150×10^6 bricks in Tatarstan.

largest brick plants in the world is about 500×10^6 conventional bricks per year. Large capacities are excessive from the standpoint of logistics. In the opinion of Russian experts [21], $(200 – 300) \times 10^6$ conventional bricks per year is completely adequate to meet the demand of the construction sector and maintenance work in an area of up to 400 km around an enterprise. It should be underscored that the main characteristic of the changes occurring today at brick plants in Russia is not so much an increase in production as the adoption of modern technological process making it possible to meet the requirements of modern consumers and support plants showing high energy and resource efficiency [22, 23].

Domestic **production of ceramic tiles** was distinguished by a high level of automation even in the 1970s – 1980s. By the beginning of the 21st century this subsector overcame a period of stagnation and the bankruptcy of a number of enterprises, which were rebuilt. After decreasing during the crisis of 2008 – 2009, the production level has gradually increased (Fig. 3).

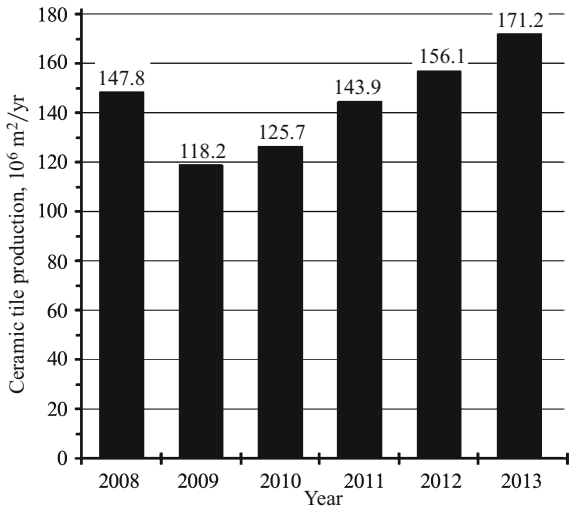

Fig. 3. Production of ceramic tiles in Russian (according to [24], with revisions).

In different market segments of the tile market domestic and foreign producers compete with one another, including producers that opened commercial sites in our country. A similar situation is also observed in the production of ceramic sanitary ware [23].

Enterprises are actively adopting modern production lines and mastering new technologies. The revitalized stock of equipment and the use of computerized quality control systems make it possible to produce diverse high-quality tiles. Domestic producers also develop their own technologies suitable for the Russian climatic conditions. For example, one of the newest advances is a ceramic tile that withstands very low temperatures and can be used to face the facades of buildings even in northern regions.

On the whole the Russian segment of the ceramic tile market can be conventionally divided into three groups:

– domestic enterprises, new or having transitioned to new production technology (KeraMir group of companies, Volgograd Ceramic Works, Nefrit-Keramika, KM Group, Ceramic Works (Uralkeramika), Stroifarfor Holding UNITILE, Sokol);

– foreign companies producing tiles in Russia (Rovese group, Lasselsberger Ceramics group in Ufa, Holding Gruppo Concorde in Stupino);

– a third group comprised of Russian enterprises producing ceramic tiles by the old technology has minimal prospects for adopting CEP.

Unfortunately, it is impossible to cover in a single article the entire spectrum of domestic producers of glass and ceramic articles: the sector is distinguished by extreme diversity of products and technological processes used. Nonetheless, the characteristic features of large companies producing glass and ceramics in Russian include the following:

– active modernization and adoption of modern technological processes by leading domestic companies and gradual displacement from the market of companies using production lines such those in 1970 – 1980;

– systematic increase of energy- and resource-efficiency of production as a result of modernization as a whole and in the process of meeting the requirements of the corresponding laws, decrees and rulings;

– strengthening of the positions of international companies and their daughter enterprises whose production lines were developed taking account of the BAT requirements issued in the member countries of the EU;

– a well-organized information exchange system (on the basis of specialized editions as well as industry associations, such as StekloSoyuz of Russia and the Association of Ceramic Wall Materials Producers);

– interaction of companies producing materials used in construction with leading construction associations, for example the National Builders Union NOSTROI.

Specialists in a number of specialized Russian enterprises participated in pilot projects, provided data for comparative analysis of energy-efficiency and environmental efficacy of production and collaborated with the developers of handbooks [20] and national standards on the best available technologies [22, 33]. The results of the projects and the information on the coordination of the positions of the interested parties with respect to the legislative bill No. 584587-5 [3] make it possible to advance a number of proposals.

All large enterprises and objects being designed, where reconstruction (expansion) of production is under way, correspondence of the work mentioned to the BAT requirements will have to be declared at the very beginning (already as part of the pre-design or design documentation). It is very likely that the procedures for evaluating the environmental effects, government experts' evaluation as well as announcing application for and issuance of a comprehensive environmental permit will be combined.

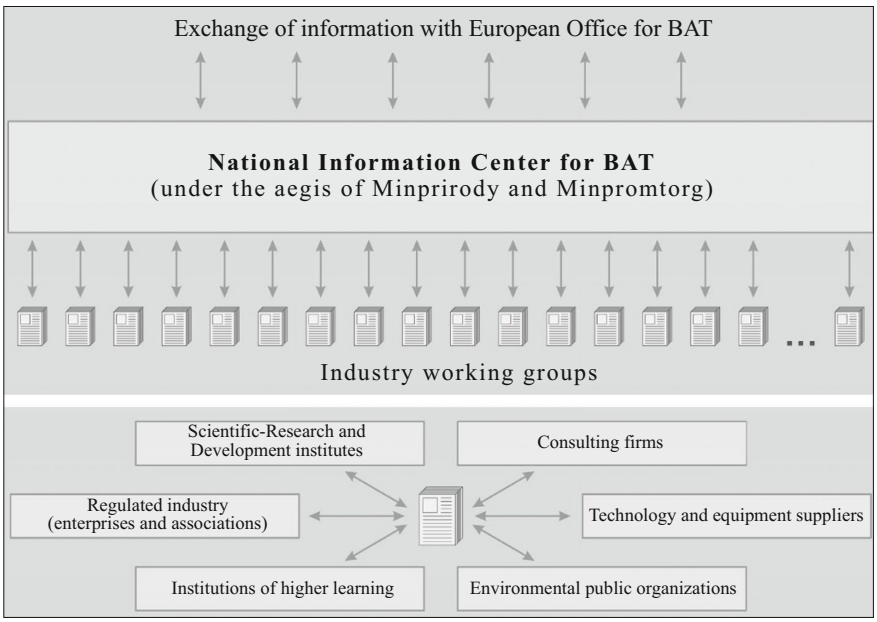

Fig. 4. Preferred scheme for exchange of information during the development of information-technical handbooks for BAT.

The requirements for BAT in Russia have not yet been formulated, just as a comparative analysis of the environmental efficacy and resource- and energy-efficiency of domestic enterprises has not been performed. The BAT parameters (consumption of resources, emissions, discharges of contaminants, production of wastes and others) are identified precisely as a result of a comparative analysis and comprise validated intervals of numerical values. They can differ from those characteristic for Europe, for example, in connection with the climatic particularities or properties of raw materials.

The situation can develop according to a number of scenarios:

– enterprises will have **to prove correspondence to the parameters of the best available technologies following individual procedures**; in the absence of an evidentiary basis and an established procedure for obtaining evidence (certificate) of correspondence a number of difficulties can arise in this case and in the subsequent CEP;

– in Russia **translations of the current information documents of EU will be performed** for the BAT and some (insignificant) adaption of them will be made; in this case it is very likely that the BAT parameters will remain unchanged and will correspond to the European parameters, while Russian enterprises will not have the opportunity of participating in the comparative analysis and discussions of the BAT requirements;

– **industry information-technical handbooks will be developed** by industry specialists during the discussion with representatives of the enterprises and the public; the procedure for developing these handbooks must be determined by federal organs of the executive branch in December 2014 [2].

It should be underscored that the last variant could become the most favorable development of the situation for Russian enterprises, but only if representatives of different interested parties participate in accordance with the participation scheme presented in Fig. 4 in the discussion of the information-technical handbooks.

The basis for the active participation of specialized enterprises and associations in the identification of BAT and the development of handbooks and national standards for BAT as well as demonstration of correspondence to the new requirements in the policy demanding initiative has already been formulated. By now translations of a number information documents from the EU on the best available technologies and domestic guidelines have been prepared and national standards for the production of glass and ceramics [25] have been developed and adopted, including the following:

– the information document for BAT in the production of ceramic articles (2009, http://14000.ru/brefs/BREF_Ceramics.pdf);

– GOST R 55645–2013: Resource conservation, Production of ceramic tiles, Guidelines for the application of the best available technologies for increasing the energy-efficiency and environmental efficacy;

– Handbook on the best available technologies by using energy resources in the glass industry: production of high-quality and container glass (2005, http://14000.ru/projects/glass/BAT_in_Energy_use.pdf);

– GOST R 54201–2010: Resource conservation, Production of high-quality and container glass; best available technologies for increasing energy efficiency.

The following are also of definite interest for enterprises producing glass and ceramics:

– Information document on BAT for securing energy efficiency (2012, http://14000.ru/projects/energy-efficiency/EnergyEfficiency2012RUS.pdf);

– GOST R 54196–2010. Resource conservation, Industrial production, Guidelines for identifying aspects of energy efficiency;

– GOST R54195–2010. Resource conservation, Industrial production, Guidelines for determining indices (indicators) for energy efficiency;

– GOST R 54197–2010. Resource conservation, Industrial production, Guidelines for planning indices (indicators) for energy efficiency;

– GOST R54198–2010. Resource conservation, Industrial production, Guidelines on using the best available technologies for increasing energy efficiency;

– Information document on the general principles of industrial environmental monitoring and control (2009, http://14000.ru/brefs/BREF_Monitoring.pdf).

In practically all information documents serious attention is devoted to *environmental management systems* (EMS). In the member countries of the EU the companies which have obtained certification of such systems gain advantages in organizing inspection control for meeting the CEP requirements. Thus, essentially voluntary adoption of EMS makes it possible to gain advantages in demonstrating correspondence to the mandatory environmental requirements.

The 'Rules and procedures for certification of enterprises of the construction materials industry with respect to the parameters of the best available technologies' (approved September 20, 2012; No. DS.NOS-16.0–2012) operate in the system for voluntary assessment of correspondence of the National Builders Union (SDOS NOSTROI). The companies producing sheet glass, ceramic bricks and tiles as well as other building materials can confirm by a voluntary procedure correspondence to the BAT parameters, established either by national standards or information documents from the EU on the best available technologies. As development advances the domestic information-technical handbooks on BAT will also be included in the system. Organs for the certification of enterprises for the BAT parameters, which have specialists in the spheres of glass and ceramics production technology as well management systems, operate in SDOS NOSTROI.

The rules for certification of enterprises, discussed above, are based on the principles for determining the production life cycle [26, 27]. They incorporate the requirements of the international standards ISO 14040:2006, Ecological management, Life cycle determination, Principles and structure and ISO 14040:2000, Environmental stamping and declaration, General principles as well as the British standard BES 6001:2009, Executive selection of sources (producers) of products for construction.

The standard BES 6001 was released by the British company BRE Global ltd., which obtained worldwide acclaim for developing the BREEAM system for evaluating real-estate objects. The standard BES 6001 describes approaches to organizational control, supply chains and environmental and social aspects taken into account in the certification of critical sources (suppliers) of building materials, which include many enterprises producing ceramic articles. We note that the production sites of Wienerberger in Great Britain are certified in accordance with the BES 6001 requirements, and the company management considers that this strengthens their market positions [28]. The procedure for taking account of the environmental efficacy of building materials in picking suppliers and making government purchases is being discussed by the government of Moscow; the adoption of new rules will directly affect the producers of sheet glass, ceramic brick, tiles, blocks and other articles.

The 'green construction' standards form the basis for a system for making decisions in this sphere. These include the following: STO NOSTROI 2.35.4–2011 'Green construction', Public and residential buildings, Rating system for assessment of the stability of living conditions and GOST R 54964–2012, Assessment of the correspondence, Environmental requirements for real estate objects. Thus, in Russia NOSTROI is a national leader: the possibility of taking account of the production life cycle in picking suppliers in the country is very rarely used.

Having started a discussion of the problem with **mandatory, legislatively established** transitioning of large glass and ceramics producers to BAT and comprehensive environment permits, we gradually arrived at comments concerning voluntary activity, adoption of the best available technologies with initiative and confirmation of the requirements pertaining to them. There are no inconsistencies here: today's voluntary assessment of environmental efficacy and energy efficiency and certification in terms of BAT will quickly become routine procedures determined by the appropriate administrative regulations and normative acts. But, as noted above, the complexity of the situation lies in the fact that neither a list of enterprises required to obtain a CEP nor the requirements (first and foremost, numerical parameters) for BAT have been established.

The rich international and some Russian experience attests that the active participation of industry specialists and practitioners, representing specialized companies, in benchmarking, developing informational-technical handbooks on BAT and organizing pilot projects is a **mandatory condition for developing and adopting realistic systems for comprehensive environment permits.**

It is only today that leading producers of glass and ceramics have a unique possibility of tipping the scales from threats to benefits and moving forward in a voluntary regime:

– develop (refine) the requisite (and validated) domestic evidentiary basis for the correspondence to BAT requirements for key producers;

– perform for this a comparative analysis of the environmental efficacy and energy efficiency of the enterprises discussed or at least perform an experts' assessment;

– include representatives of specialized associations and (or) the largest companies in the intersector council on transitioning to the principles of the best available technolo-

gies and adoption of modern technologies, formed by the Ministry of Industry and Trade of the Russian Federation;

– in an extreme case stipulate policy for interaction of the Interagency council with specialized associations;

– undergo voluntary evaluation of the correspondence and obtain documents (certificates) attesting to correspondence to technological processes, technical setups and systems for managing BAT requirements;

– discuss the possibility of treating a certificate as a document attesting to the adoption of BAT (the equivalent of the above-mentioned audit), during the formulation of an announcement and obtaining a comprehensive environmental permit;

– announce an initiative in Minpriroda of Russia to develop and sign a voluntary agreement between the industrial sectors and specially authorized organs; in accordance with this agreement information documents available today and BAT standards put into effect can obtain the status of national documents comprising the evidentiary basis for the comprehensive environmental permit system;

– it is expedient to continue the development of standards and previously developed standards (for example, for BAT for the production of container glass) should be evaluated and, if necessary, actualized.

Such actions will make it possible for leading enterprises and associations to strengthen their positions and demonstrate readiness to meet the time requirements for lowering the load on the environment in steps.

We understand that the obviously environmental orientation of this article can have the effect that the publication will seem to Russian practitioners to be somewhat one-sided while the risk discussed in it not too significant for domestic producers of glass and ceramics. However, in Russia the problem of expanding the best available technologies is regarded today in a much broader context. The requirements for adopting BAT comprise the foundation of a system measures for stimulating the adoption of modern efficient technologies in industry [2]. The best available technologies are regarded as one of the significant directions of development of the concept of technological corridors [5], according to which mandatory (and successively more stringent) requirements and limitations are imposed on the technical parameters of the technologies used and on consumer products and services. Finally, if the strategy for Russia, in the colorful words of one of the leaders of the state, is 'coercion for innovation' [29], then today BAT is one of the important directions of such coercion. For this reason, it is necessary to prepare carefully for the adoption of the best available technologies and the transition to comprehensive environmental permits in the production of glass and ceramics, using domestic scientific, engineering-technical and control potential and taking into account the experience gained in countries where these changes have already become a reality.

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